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ASSIGNMENT BOOKLET 2A

MAT3038 Applied Mathematics 30
Module 2: Activities 1 and 2 Assignment

FOR STUDENT USE ONLY

Date Assignment Submitted: ____________________

Time Spent on Assignment: ____________________

(If label is missing or incorrect)

Student File Number: ____________________

Module Number: ____________

FOR OFFICE USE ONLY

Assigned Teacher: ____________

Assignment Grading: ____________

Graded by: ____________

Date Assignment Received:

Student's Questions and Comments

Apply Module Label Here

Name

Address

Postal Code

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Teacher's Comments

____
Teacher

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- Has your work been reread to ensure accuracy in spelling and details?
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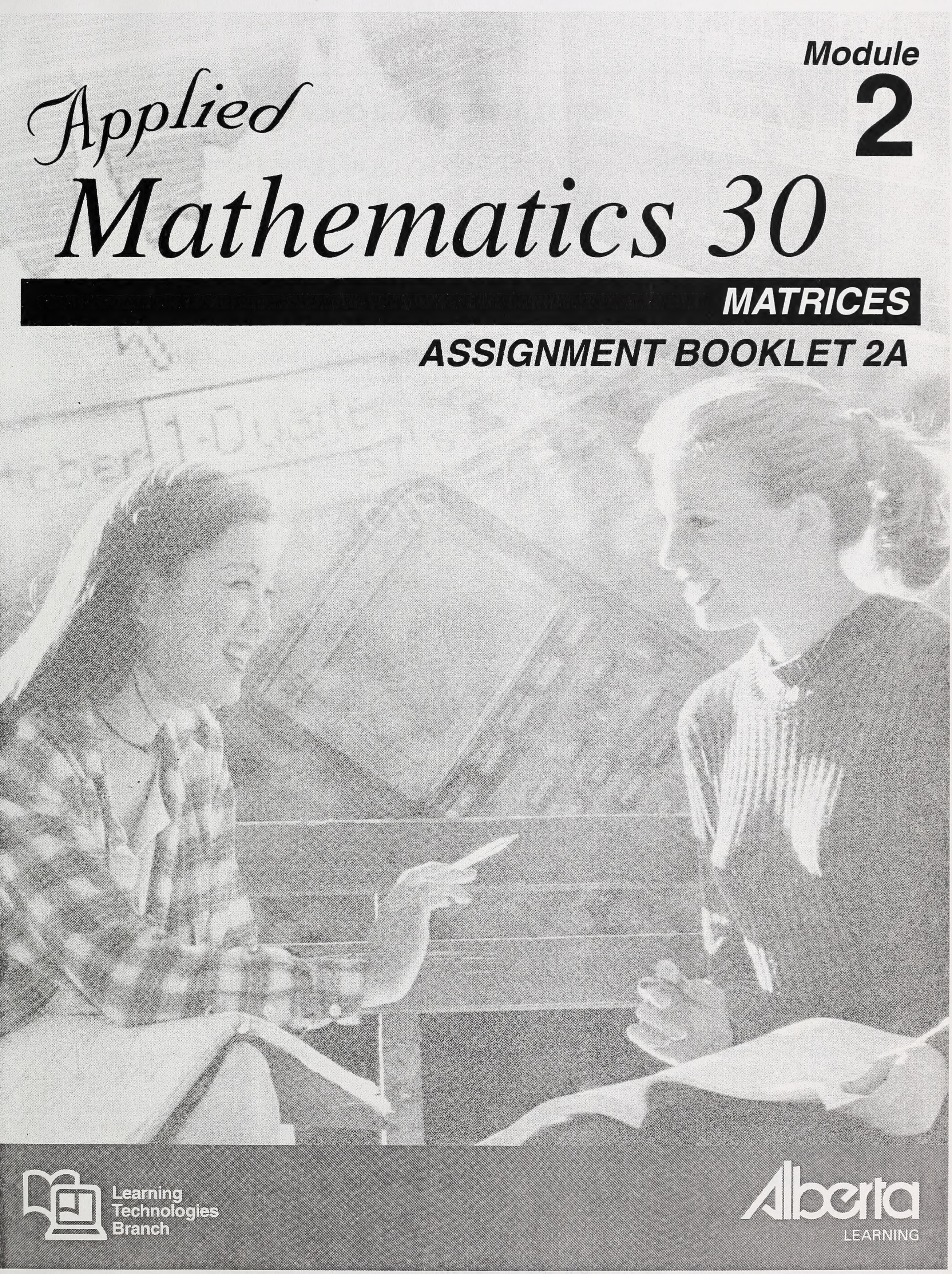
Module
2

Applied Mathematics 30

MATRICES

ASSIGNMENT BOOKLET 2A



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LEARNING

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Summary

	Total Possible Marks	Your Mark
Activities 1 and 2 Assignment	70	

Teacher's Comments

Applied Mathematics 30
Module 2: Matrices
Assignment Booklet 2A
Activities 1 and 2 Assignment
Learning Technologies Branch
ISBN 0-7741-2184-X

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Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

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ASSIGNMENT BOOKLET 2A
APPLIED MATHEMATICS 30: MODULE 2
ACTIVITIES 1 AND 2 ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 70 marks out of the total 200 marks for the assignments in Module 2. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

Activities 1 and 2 Assignment

(70)

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

② **1.** Summarize, in your own words, how to add and subtract two matrices.

Return to page 17 of the Student Module Booklet and continue with Activity 1.

③ **2.** Answer exercise 4 of "Discussing the Ideas" on page 55 of the textbook.

Return to page 18 of the Student Module Booklet and continue with Activity 1.

① **3.** In exercise 5.b. of “Exercises: Checking Your Skills” on page 57 of the textbook, state the dimensions of the matrix that represents the cost in U.S. dollars.

③ **4.** Answer exercise 5.c. of “Exercises: Checking Your Skills” on page 57 of the textbook. Use Can $1.00 = ¥79.172.

② **5.** In exercise 7.b. on page 58 of the textbook, what formula in terms of Matrix *A* and Matrix *B* would be used to determine the daily pay for each worker if the overtime rate was double time?

Return to page 19 of the Student Module Booklet and continue with Activity 1.

6. Complete exercises 7 and 8 of “Investigation 1: Multiplying Matrices” on page 60 of the textbook.

③ **Textbook exercise 7:** ____________________

② **Textbook exercise 8:** ____________________

Return to page 21 of the Student Module Booklet and continue with Activity 2.

7. Complete exercises 4 and 6 of “Investigation 2: Dimensions of the Product Matrix” on page 62 of the textbook.

① **Textbook exercise 4:** ____________________

② **Textbook exercise 6:** ____________________

Return to page 21 of the Student Module Booklet and continue with Activity 2.

② **8.** Answer exercise 1 of “Discussing the Ideas” on page 63 of the textbook.

Return to page 24 of the Student Module Booklet and continue with Activity 2.

9. Answer exercises 3, 4, and 5 of “Discussing the Ideas” on page 63 of the textbook.

② **Textbook exercise 3:** __________

② **Textbook exercise 4:** __________

② **Textbook exercise 5:** __________

Return to page 24 of the Student Module Booklet and continue with Activity 2.

To answer questions 10 to 12, go back and review exercises 1 to 8 of "Getting Started" on pages 23 to 25 of the Project Book. Enter the matrices into your calculator as you proceed. Perform the required operations to obtain matrices *C*, *F*, *H*, *J*, *K*, and *L*. If you have a TI-83 graphing calculator and require help entering the matrices and performing the required operations, turn to pages 347 and 348 of the textbook and work through Utility 26: "Using the TI-83 to Perform Matrix Operations." If you have a graphing calculator other than the TI-83, consult the owner's manual that came with your calculator for help with matrix operations.

⑥ **10.** Write out matrices *C*, *F*, *H*, *J*, *K*, and *L*.

⑥ **11.** Suppose labour costs rise by 20%. Use your graphing calculator to determine the updated matrices *C*, *F*, *H*, *J*, *K*, and *L*. Write them out.

② **12.** What do you notice about the total profits for the different items in matrix L? Explain why this is the case even though labour costs have increased.

Return to page 27 of the Student Module Booklet and continue with Activity 2.

13. A travel company is advertising package tours to a popular holiday destination. The prices are quoted in Canadian dollars.

Starting Point	**Length and Cost of Tour**		
	3 days	**5 days**	**7 days**
Calgary	$590	$790	$950
Edmonton	$650	$825	$999
Regina	$625	$815	$975
Saskatoon	$660	$840	$999

① **a.** Rewrite this table as matrix P.

① **b.** What are the dimensions of matrix P?

① **c.** You can use subscripts to identify elements of this matrix. If you use a_{ij} to specify these elements, what entry in the matrix is a_{13}?

③ **d.** Suppose the current exchange rate between Canadian and American dollars is Can $1.00 = US $0.66. Identify and perform a matrix operation that will convert the entries in matrix *P* to costs in American dollars.

14. Marta has checked the prices of two different models (model A and model B) of mountain bikes at two different cycle shops (shop X and shop Y) in her neighbourhood. She has used a matrix, *M*, to model the prices of these bikes.

$$\begin{array}{cc} & \begin{array}{cc} \text{X} & \text{Y} \end{array} \\ \begin{array}{c} \text{A} \\ \text{B} \end{array} & \begin{bmatrix} 570 & 585 \\ 650 & 625 \end{bmatrix} \end{array}$$

If Marta buys one of these bikes, she will have to pay an additional 7% (GST) on her purchase.

② **a.** Explain what the matrix $M + 0.07M$ represents.

② **b.** Determine $M + 0.07M$ using your graphing calculator.

④

15. Determine matrix *A*.

$$3\begin{bmatrix} 2 & -3 \\ 4 & 0 \end{bmatrix} + 2A = \begin{bmatrix} 6 & 9 \\ 0 & -2 \end{bmatrix}$$

16. The top four teams in the Big West Hockey League have just completed the first half of their season. Each team has played 20 games. The team statistics are listed in the following table. Each team is awarded 3 points for a win, 2 points for an overtime tie, and 1 point for a tie in regulation but a loss in overtime.

Team	Wins	Regulation Losses	Overtime Ties	Overtime Losses
Grizzlies	12	4	2	2
Wolverines	10	8	2	0
Cougars	9	5	3	3
Coyotes	8	5	7	0

② **a.** Use matrices to model the team statistics and the point system.

③ **b.** Use matrix multiplication to determine the points for each team.

② **c.** What are the team standings?

17. Given $A = \begin{bmatrix} 2 & 4 & -2 \\ 6 & -2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 1 & 0 \\ -1 & 3 & -5 \\ 4 & -2 & 0 \end{bmatrix}$, answer the following.

③ **a.** Which product is defined, $A \times B$ or $B \times A$? Justify your answer.

② **b.** Use your graphing calculator to determine the product in question 17.a.

③ **18.** Solve for x in the following equation.

$$\begin{bmatrix} 2 & -1 & 4 \\ 0 & 1 & -2 \end{bmatrix} \times \begin{bmatrix} 3 & -1 \\ x & 0 \\ -1 & 6 \end{bmatrix} = \begin{bmatrix} -2 & 22 \\ 6 & -12 \end{bmatrix}$$

Submit your completed Assignment Booklet 2A to your teacher for assessment.
Then return to page 28 of the Student Module Booklet and begin Activity 3.

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c.2
v.2 booklet B

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ASSIGNMENT BOOKLET 2B

MAT3038 Applied Mathematics 30
Module 2: Activities 3 and 4 Assignment, Module Review Assignment, and Module Project

FOR STUDENT USE ONLY

Date Assignment Submitted: ____________________

Time Spent on Assignment: ____________________

(If label is missing or incorrect)

Student File Number: ____________________

Module Number: ____________

FOR OFFICE USE ONLY

Assigned Teacher: ____________

Assignment Grading: ____________

Graded by: ____________

Date Assignment Received:

Student's Questions and Comments

Apply Module Label Here

Name ____________

Address ____________

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Teacher's Comments

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Teacher

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- Is the booklet cover filled out and the correct module label attached?

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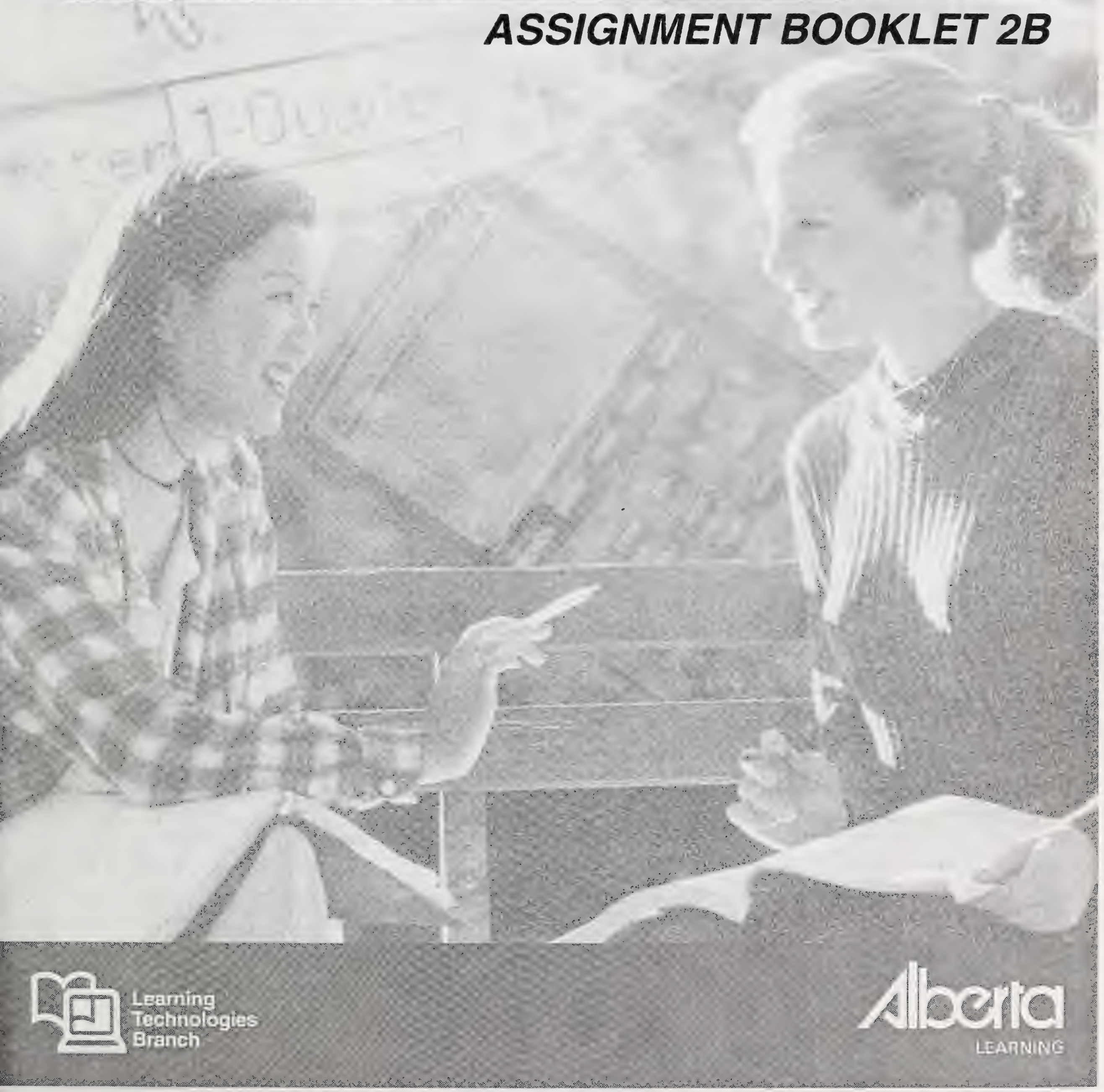
Module
2

Applied Mathematics 30

MATRICES

ASSIGNMENT BOOKLET 2B



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Summary

	Total Possible Marks	Your Mark
Activities 3 and 4 Assignment	70	
Module Review Assignment	20	
Module Project	40	
	130	

Teacher's Comments

Applied Mathematics 30
Module 2: Matrices
Assignment Booklet 2B
Activities 3 and 4 Assignment, Module Review Assignment, and Module Project
Learning Technologies Branch
ISBN 0-7741-2185-8

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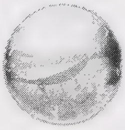
Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	



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- Learning Resources Centre, **http://www.lrc.learning.gov.ab.ca**

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ASSIGNMENT BOOKLET 2B
APPLIED MATHEMATICS 30: MODULE 2
ACTIVITIES 3 AND 4 ASSIGNMENT, MODULE REVIEW ASSIGNMENT, AND MODULE PROJECT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 130 marks out of the total 200 marks for the assignments in Module 2. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

(70)

Activities 3 and 4 Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.

② **1.** Answer exercise 1 of “Discussing the Ideas” on page 76 of the textbook.

____

____

Return to page 30 of the Student Module Booklet and continue with Activity 3.

2. Answer exercises 2, 3, and 4 of “Discussing the Ideas” on page 76 of the textbook.

③ **Textbook exercise 2:** ______________________________

____

____

____

____

____

____

②

Textbook exercise 3: __________

②

Textbook exercise 4: __________

Return to page 32 of the Student Module Booklet and continue with Activity 3.

② **3.** State two areas where the use of matrices and networking is important.

② **4.** You are given the following matrix. Use the letters A, B, C, and D to represent the matrix. Which letters would have a curved arrow indicating the letter can go to itself? **Hint:** Write the matrix as a table.

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 0 & 0 & 0 \end{bmatrix}$$

____

5. Answer exercises 3 and 4 of "Exercises: Checking Your Skills" on pages 76 and 77 of the textbook.

② **Textbook exercise 3.a.:**

③ **Textbook exercise 3.b.:**

③ **Textbook exercise 3.c.:** ____________________

③ **Textbook exercise 4.a.:**

③ **Textbook exercise 4.b.:**

③ **Textbook exercise 4.c.:**

Return to page 32 of the Student Module Booklet and continue with Activity 3.

② **6.** Explain how you would get P_{19} in exercise 7 of "Investigation: Finding *n*-Step Probabilities" on page 81 of the textbook.

Return to page 37 of the Student Module Booklet and continue with Activity 4.

7. Answer exercises 1 and 3 of "Exercises: Checking Your Skills" on page 83 of the textbook.

② **Textbook exercise 1.a.:**

② **Textbook exercise 1.b.:**

② **Textbook exercise 1.c.:**

② **Textbook exercise 3:**

Return to page 37 of the Student Module Booklet and continue with Activity 4.

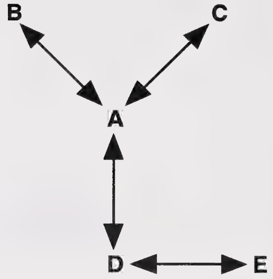
8. Answer exercise 8 of "Exercises: Checking Your Skills" on page 85 of the textbook.

③ **Textbook exercise 8.a.:**

② **Textbook exercise 8.b.:**

Return to page 39 of the Student Module Booklet and continue with Activity 4.

9. The headquarters of a trucking company is located in city A. This company has routes to cities B, C, D, and E (as shown in the diagram).



④ **a.** Set up a table with the cities in alphabetical order to show how the network matrix can be obtained. Use 1 to represent a direct link between two cities and 0 to represent no direct link. Write the network matrix, M, that follows from your table.

③ **b.** If matrix M is squared, it can represent the network matrix for one-way routes and round-trip routes that have exactly one stopover. (A stopover occurs when a truck stops or passes through another city on its way to its final destination.) Evaluate M^2.

③ **c.** One of the entries in the matrix M^2 is 3. Explain what this entry represents by referring to cities in the transportation network.

② **d.** What does the matrix $M + M^2 + M^3$ represent?

③ **e.** Determine matrix $M + M^2 + M^3$, and create a table that summarizes the network represented by this matrix.

10. A recently introduced cereal is sold in two sizes: 300 mL and 500 mL. Market research shows that 20% of the buyers of the 300-mL size switch to the 500-mL size on their next purchase. It also shows that 25% of the buyers of the 500-mL size switch to the 300-mL size on their next purchase. The research shows that 80% of first-time buyers purchase the 300-mL size and 20% of first-time buyers purchase the 500-mL size.

② **a.** Write the initial probability matrix, P_0.

② **b.** Write the transition matrix, T.

② **c.** Write the expression for the matrix that represents the probability matrix for third-time buyers. Use only P_0 and T in this expression.

____

④ **d.** Find the probability matrix for third-time buyers.

Return to page 40 of the Student Module Booklet and begin the Module Review.

⑳

Module Review Assignment

Answer all the questions in this assignment on the answer sheet provided on page 18 of this Assignment Booklet. The answer sheet is similar to the one that will be used on the Diploma Examination for Applied Mathematics 30. Read the following information before proceeding.

Multiple Choice

- Decide which of the choices **best** completes the statement or answers the question.

- Locate that question number on the separate answer sheet provided, and fill in the circle that corresponds to your choice.

Example

This assignment is for the subject of

A. biology
B. physics
C. chemistry
D. mathematics

Answer Sheet

Ⓐ Ⓑ Ⓒ ●

Numerical Response

- Record your answer on the answer sheet provided by writing it in the boxes and then filling in the corresponding circles.

- If an answer is a value between 0 and 1 (e.g., 0.7), then be sure to record the 0 before the decimal place.

- **Enter the first digit of your answer in the left-hand box. Any boxes on the right that are not needed are to remain blank.**

Examples

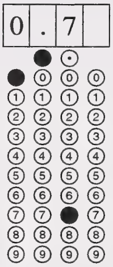
Calculation Questions and Solutions

The value of $\tan 35°$, to the nearest tenth, is __________.

(Record your answer in the numerical-response section on the answer sheet.)

Calculator value: 0.700 207 5
Value to be recorded: 0.7

Record 0.7 on the answer sheet. ⟶



A particular matrix operation produces the equation

$$2\begin{bmatrix} 1 & 0.5 \\ 1.5 & 4 \end{bmatrix} = \begin{bmatrix} a & b \\ c & 8 \end{bmatrix}$$

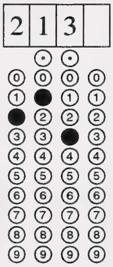
In the equation above, the value of

a is _______ (Record in the **first** column.)
b is _______ (Record in the **second** column.)
c is _______ (Record in the **third** column.)

(Record all **three digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 213

Record 213 on the answer sheet. ⟶



Correct-Order Question and Solution

Four different sets of data produce the following standard deviations.

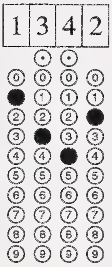
1 0.3 **2** 2.4
3 1.6 **4** 1.9

When these four standard deviations are arranged in order from **lowest** to **highest**, the order is _______, _______, _______, and _______.

(Record all **four digits** of your answer in the numerical-response section on the answer sheet.)

Value to be recorded: 1342

Record 1342 on the answer sheet. ⟶



② **1.** In the following matrix addition, what is element c_{13}?

$$C = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} + \begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$$

A. $1 + a$
B. $3 + c$
C. $5 + e$
D. $7 + g$

② **2.** In the following matrix multiplication, what is element m_{32}?

$$M = \begin{bmatrix} 1 & 2 \\ 3 & 4 \\ 5 & 6 \end{bmatrix} \times \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$$

A. $5b + 6e$
B. $a + 2d$
C. $3b + 4e$
D. $3c + 4f$

② **3.** What is the matrix product of the following?

$$\begin{bmatrix} 1 & -2 \\ -3 & 4 \end{bmatrix} \times \begin{bmatrix} 3 & 5 \\ 7 & -11 \end{bmatrix}$$

A. $\begin{bmatrix} -12 & 14 \\ 40 & -58 \end{bmatrix}$

B. $\begin{bmatrix} 13 & -21 \\ -33 & 53 \end{bmatrix}$

C. $\begin{bmatrix} -11 & 27 \\ 19 & -59 \end{bmatrix}$

D. $\begin{bmatrix} 17 & -27 \\ -37 & 59 \end{bmatrix}$

②

4. If matrix A represents the contacts between four spies, which matrix represents the number of ways the spies can contact each other with the message passing through no more than two intermediaries?

$$A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 1 & 1 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 0 & 1 \end{bmatrix}$$

A. $\begin{bmatrix} 8 & 6 & 3 & 7 \\ 7 & 5 & 5 & 6 \\ 3 & 1 & 2 & 5 \\ 6 & 3 & 1 & 5 \end{bmatrix}$

B. $\begin{bmatrix} 10 & 7 & 4 & 8 \\ 8 & 6 & 6 & 8 \\ 4 & 1 & 2 & 6 \\ 7 & 4 & 1 & 6 \end{bmatrix}$

C. $\begin{bmatrix} 7 & 5 & 3 & 6 \\ 6 & 4 & 4 & 6 \\ 3 & 1 & 1 & 4 \\ 5 & 3 & 1 & 4 \end{bmatrix}$

D. $\begin{bmatrix} 11 & 8 & 4 & 9 \\ 9 & 7 & 7 & 8 \\ 4 & 1 & 3 & 7 \\ 8 & 4 & 1 & 7 \end{bmatrix}$

Numerical Response

②

1. What is the largest element in the fifth power of the following matix?

$$\begin{bmatrix} 1 & -2 & 4 \\ 0 & 3 & -1 \\ 2 & 2 & 5 \end{bmatrix}$$

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer questions 5 and 6 and numerical-response question 2.

Sam is an honours student in Ukrainian. The probability of Sam getting an honours grade on the first test is 88%. If Sam gets an honours grade on the first test, the probability of an honours grade on the next test is 95%. However, if Sam does not receive an honours grade on the first test, the probability of an honours grade on the next test is only 75%.

② **5.** What is the initial probability matrix?

A. $\begin{bmatrix} 0.88 & 0.12 \end{bmatrix}$

B. $\begin{bmatrix} 0.75 & 0.25 \end{bmatrix}$

C. $\begin{bmatrix} 0.88 & 0.12 \\ 0.25 & 0.75 \end{bmatrix}$

D. $\begin{bmatrix} 0.88 & 0.95 \\ 0.05 & 0.12 \end{bmatrix}$

② **6.** What is the transition matrix?

A. $\begin{bmatrix} 0.12 & 0.88 \\ 0.05 & 0.95 \end{bmatrix}$

B. $\begin{bmatrix} 0.95 & 0.05 \\ 0.75 & 0.25 \end{bmatrix}$

C. $\begin{bmatrix} 0.88 & 0.12 \\ 0.95 & 0.05 \end{bmatrix}$

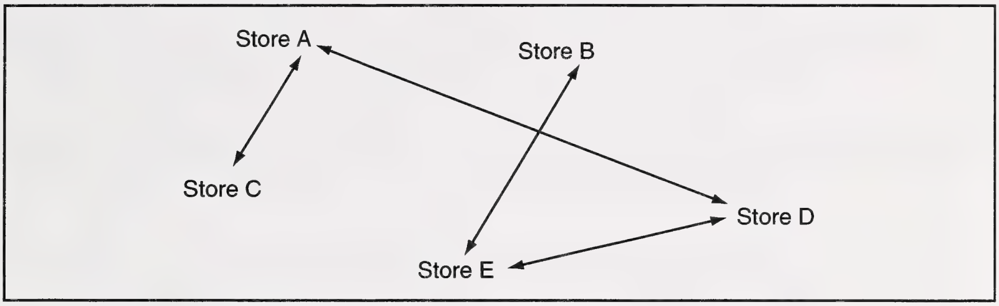
D. $\begin{bmatrix} 0.95 & 0.12 \\ 0.25 & 0.75 \end{bmatrix}$

Numerical Response

② **2.** What is the probability of Sam getting an honours grade on the tenth test? Round your answer to the nearest tenth of a percent.

(Record your answer in the numerical-response section on the answer sheet.)

Use the following information to answer question 7 and numerical-response question 3.



② **7.** The preceding diagram shows the communication links between five locations of a tire company. If the linkages are put in alphabetical order, which matrix represents these communication linkages?

A. $\begin{bmatrix} 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 & 0 \end{bmatrix}$

Numerical Response

② **3.** What is the smallest number of relaying message points required to get a message between Store B and Store C?

(Record your answer in the numerical-response section on the answer sheet.)

Answer Sheet

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
4. Ⓐ Ⓑ Ⓒ Ⓓ
5. Ⓐ Ⓑ Ⓒ Ⓓ
6. Ⓐ Ⓑ Ⓒ Ⓓ
7. Ⓐ Ⓑ Ⓒ Ⓓ

Numerical Response

1.

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⑤ ⑤ ⑤ ⑤
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⑧ ⑧ ⑧ ⑧
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Return to page 40 of the Student Module Booklet and continue with the Module Review.
If your teacher has indicated that the Module 2 project does not need to be completed, submit Assignment Booklet 2B to your teacher for assessment.

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Module Project: Creating a Long-Distance Telephone Plan

Your teacher may not require you to complete all the projects in this Applied Mathematics 30 course. Contact your teacher and check whether you need to complete the Module 2 project, Creating a Long-Distance Telephone Plan, as part of your assessment.

If you are required to complete this project, **read all parts of the project carefully and record your answers in the appropriate places. Clearly show how you arrived at your answers by showing your work.**

This project involves researching competing long-distance plans operating in your area and proposing an alternative long-distance telephone plan. You will examine the costs of these plans for your family and, using survey data, predict how many telephone subscribers in your area would switch to your proposed long-distance plan.

1. Obtain details about the rates charged by two competing long-distance telephone providers in your area. Write a brief report on each plan. In each report, include details on any minimum monthly charges, incentives, and the rates charged for weekday, long-distance calls within Canada and to the United States. If they offer discount rates for evening or weekend calls, be sure to include this information in your reports. Also, include their rates for using a calling card.

⑤ **a.** Name of Provider: ______________________________

Details of Their Long-Distance Plan

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⑤ **b.** Name of Provider: ______________________

Details of Their Long-Distance Plan

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⑤ **2.** Propose an alternative to the plans that you summarized in question 1. Your proposal must be practical, ensuring that your company would operate at a profit while offering competitive rates.

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⑤ **3.** **a.** Use the information on rates for the three long-distance telephone providers outlined on page 70 of the textbook and the information you provided in question 2 to complete the following table.

	Dash	**TellMe**	**BellWest**	**Your Plan**
Canada: daytime, weekday				
Canada: nighttime, weekend				
U.S.: daytime, weekday				
U.S.: nighttime, weekend				
Calling Card—Canada: daytime, weekday				
Calling Card—Canada: nighttime, weekend				
Calling Card—U.S.: daytime, weekday				
Calling Card—U.S.: nighttime, weekend				

② **b.** Write a matrix, *A*, to represent the rates in the table in question 3.a. Then enter this matrix into your graphing calculator.

② **c.** Use your family's last long-distance telephone bill (or create one of your own) to determine the number of minutes in each of the eight calling categories. Write a row matrix, *B*, to represent this information; then enter this matrix into your graphing calculator.

③ **d.** Use matrix multiplication to determine what your family's bill would have been for each of the four plans. Write the statement showing the matrix multiplications and the results you obtained.

4. Suppose you randomly surveyed 200 of the 10 000 long-distance subscribers in your area. You first asked them which provider they were currently with. Next, you outlined the rates offered through the four plans from question 3. Then you inquired, based on the information you gave them, whether they would remain with their plan or change to a new provider. You summarized your results in the following table. The figures are the number of subscribers in each category.

Current Provider		**Provider the Subscribers Intend to Use in the Future**			
Company	**Number**	**Dash**	**TellMe**	**BellWest**	**Your Plan**
Dash	60	50	3	4	3
TellMe	50	4	40	2	4
BellWest	90	2	3	80	5
Your Plan	0	0	0	0	0

⑧ **a.** Based on the results of this survey, determine the initial probability matrix, P_0, and the transition matrix, *T*. Round the entries to 3 decimal places where necessary.

⑤ **b.** Use the matrices in question 4.a. to predict the number of long-distance subscribers in your area that would convert to your plan. Outline the details of how you arrived at your prediction. Round your values to 2 decimal places where necessary.

Submit your completed Assignment Booklet 2B to your teacher for assessment.

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